

CLAIMS:

1. A traffic management method in a telecommunication system, the method including:

dividing a time slot into a predetermined number of sub-blocks,
defining an amount of available capacity for a non-real time use in a time slot;

defining a number of sub-blocks reserved by a real-time use in a time slot;

defining a number of sub-blocks reserved by non-real time use in a time slot;

defining a number of free sub-blocks in a time slot based on the sub-blocks reserved by the real-time use and the sub-blocks reserved by the non-real time use;

calculating a sub-block reservation rate for a time slot based on the number of free sub-blocks, the amount of available capacity for the non-real time use in the time slot and the number of sub-blocks in a time slot not reserved by real time use; and

averaging a sub-block reservation rate for a time slot to determine a down link sub-block reservation rate.

2. A traffic management method in a telecommunication system, the method comprising:

dividing a time slot into a predetermined number of sub-blocks;
defining an amount of available capacity for a non-real time use in a time slot;

defining a number of sub-blocks reserved by a real time use in a time slot;

defining a number of sub-blocks reserved by a non-real time use in a time slot,

defining a number of free sub-blocks in a time slot based on the sub-blocks reserved by the real time use and the sub-blocks reserved by the non-real time use,

calculating a sub-block reservation rate for a time slot based on the number of free sub-blocks, the amount of available capacity for the non-real time use in a time slot and the number of sub-blocks in a time slot not reserved by real time use;

averaging a sub-block reservation rate for a time slot to determine a down link sub-block reservation rate; and

directing a transmission in a telecommunication system to less loaded cells or timeslots.

3. The method of claim 1, wherein the amount of available capacity for the non-real time use in a time slot is defined by using the equation:

$$NRT_share_per_TSL^i = \max \left(0, 1 - \frac{\sum_{j=0}^{M^i} GBR_j^i}{R_{rb_est}^i} \right),$$

where

M = a number of real time users per timeslot having a guaranteed bit rate,

GBR means a guaranteed bit rate,

R_{rb_est} = average bit rate per radio block in a time slot,

i means a time slot of interest.

4. The method of claim 1, wherein the sub-block reservation rate for a time slot is defined by using the equation:

$$TBFresevationrate^i = 1 - \frac{9 - TBF_{RT}^i - TBF_{NRT}^i}{\frac{1}{NRT_share_per_TSL^i} \cdot (9 - TBF_{RT}^i)},$$

where

TBF means temporary block flow,
RT means a real time user,
NRT means a non-real time user,
i means a time slot of interest,
NRT_share_per_TSLⁱ is the amount of available capacity for non-real time use in a time slot.

5. The method of claim 1, wherein the averaging for determining a down link sub-block reservation rate is carried out by using the equation:

$$TBFreservationrateDL = \frac{\sum_{i=0}^{TSL_{total}} TBFreservationrate^i}{TSL_{total}},$$

where

TBF means temporary block flow,
TSL_{total} means the number of time slots reserved for non-real time use,
i means a time slot of interest.

6. The method of claim 1, wherein the averaging for determining a down link sub-block reservation rate is carried out by using the equation:

$$TBFreservationrateDL = \frac{\sum_{i=0}^{TSL_{total}} NRT_share_per_TSL^i \cdot TBFreservationrate^i}{\sum_{i=0}^{TSL_{total}} NRT_share_per_TSL^i}$$

where

TBF means temporary block flow,
TSL_{total} means the number of time slots reserved for non-real time use,
i means a time slot of interest.
NRT_share_per_TSLⁱ is the amount of available capacity for non-real time use in a time slot.

7. The method of claim 1, wherein . the sub-blocks comprise temporary block flow sub-blocks.

8. The method of claim 1, wherein the averaging is carried out for a group comprising time slots reserved for non-real time use in a cell

9. A network element comprising means for:
dividing a time slot into a predetermined number of sub-blocks,
defining an amount of available capacity for a non-real time use in a time slot,
defining a number of sub-blocks reserved by a real time use in a time slot,
defining a number of sub-blocks reserved by a non-real time use in a time slot,
defining a number of free sub-blocks in a time slot based on sub-blocks reserved by the real time use and the sub-blocks reserved by the non-real time use,
calculating a sub-block reservation rate for a time slot based on the number of free sub-blocks, the amount of available capacity for the non-real time use in the time slot and the number of sub-blocks in a time slot not reserved by real time use; and
averaging a sub-block reservation rate for a time slot to determine a down link sub-block reservation rate.

10. A network element comprising means for:
dividing a time slot into a predetermined number of sub-blocks,
defining an amount of available capacity for a non-real time use in a time slot,
defining a number of sub-blocks reserved by a real time use in a time slot,

defining a number of sub-blocks reserved by a non-real time use in a time slot,

defining a number of free sub-blocks in a time slot based on the sub-blocks reserved by the real time use and the sub-blocks reserved by the non-real time use,

calculating a sub-block reservation rate for a time slot based on the number of free sub-blocks, the amount of available capacity for the non-real time use in the time slot and the number of sub-blocks in a time slot not reserved by real time use,

averaging a sub-block reservation rate for a time slot to determine a down link sub-block reservation rate; and

directing a transmission in a telecommunication system to less loaded cells or timeslots.

11. The network element of claim 10, wherein the amount of available capacity for the non-real time use in the time slot is defined by using the equation:

$$NRT_share_per_TSL^i = \max \left(0, 1 - \frac{\sum_{j=0}^{M'} GBR_j^i}{R_{rb_est}^i} \right),$$

where

M = a number of real time users per timeslot having a guaranteed bit rate,

GBR means a guaranteed bit rate,

R_{rb_est} = average bit rate per radio block in a time slot,

i means a time slot of interest.

12. The network element of claim 10, wherein the sub-block reservation rate for a time slot is defined by using the equation:

$$TBFreservationrate^i = 1 - \frac{9 - TBF_{RT}^i - TBF_{NRT}^i}{\frac{1}{NRT_share_per_TSL^i} \cdot (9 - TBF_{RT}^i)},$$

where

TBF means temporary block flow,

RT means a real time user,

NRT means a non-real time user,

i means a time slot of interest,

$NRT_share_per_TSL^i$ is an amount of available capacity for non-real time use in a time slot.

13. The network element of claim 10, wherein the averaging for determining a down link sub-block reservation rate is carried out by using the equation:

$$TBFreservationrateDL = \frac{\sum_{i=0}^{TSL_{total}} TBFreservationrate^i}{TSL_{total}},$$

where

TBF means temporary block flow,

TSL_{total} means a number of time slots reserved for the non-real time use,

i means a time slot of interest.

14. The network element of claim 10, wherein the averaging for determining a down link sub-block reservation rate is carried out by using the equation:

$$TBFreservationrateDL = \frac{\sum_{i=0}^{TSL_{total}} NRT_share_per_TSL^i \cdot TBFreservationrate^i}{\sum_{i=0}^{TSL_{total}} NRT_share_per_TSL^i}$$

where

TBF means temporary block flow,

TSL_{total} means a number of time slots reserved for the non-real time use,

i means a time slot of interest.

$NRT_share_per_TSL^i$ is the amount of available capacity for the non-real time use in a time slot.

15. The network element of claim 10, wherein the sub-blocks comprise temporary block flow sub-blocks.

16. The network element of claim 10, wherein the averaging is carried out for a group comprising time slots reserved for non-real time use in a cell.

17. A network element configured to:

divide a time slot into a predetermined number of sub-blocks;

define an amount of available capacity for a non-real time use in a time slot;

define a number of sub-blocks reserved by a real time use in a time slot;

define a number of sub-blocks reserved by a non-real time use in a time slot;

define a number of free sub-blocks in a time slot based on sub-blocks reserved by the real time use and the sub-blocks reserved by the non-real time use;

calculate a sub-block reservation rate for a time slot based on the number of free sub-blocks the amount of available capacity for non-real time use in the time slot and the number of sub-blocks in a time slot not reserved by real time use,; and

average a sub-block reservation rate for a time slot to get down link sub-block reservation rate.

18. A network element configured to:

- divide a time slot into a predetermined number of sub-blocks,
- define an amount of available capacity for a non-real time use in a time slot;
- define a number of sub-blocks reserved by real time use in a time slot,
- define a number of sub-blocks reserved by a non-real time use in a time slot;
- define a number of free sub-blocks in a time slot based on sub-blocks reserved by the real time use and the sub-blocks reserved by the non-real time use;
- calculate a sub-block reservation rate for a time slot based on the number of free sub-blocks, the amount of available capacity for the non-real time use and the number of sub-blocks in a time slot not reserved by real time use,;
- average a sub-block reservation rate for a time slot to determine a down link sub-block reservation rate; and
- direct a transmission in a telecommunication system to less loaded cells or timeslots.